



The CLiMB Newsletter

CENTER FOR LIMB LOSS AND MOBILITY

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Young Investigators Present Research at August 17 Symposium

The Center for Limb Loss and MoBility (CLiMB) held its 2017 Young Investigator Symposium on August 17. This event has been held every year but one since 2003. The symposium provides an opportunity for students doing research with CLiMB investigators to present their research results to a supportive VA audience. Although the presenters had little or no prior experience giving research presentations, all nine did an excellent job.

This year's presenters included engineering undergraduate Kalle Chastain and graduate students Gaurav Mukherjee, Alexander Berardo-Cates, Lalit Palve, Evan Schuster, Eric Thorhauer and Anthony Anderson. The group also included medical student Jacob Hornbuckle and Elizabeth Halsne, a Certified Prosthetist Orthotist who is a graduate student in both engineering and rehabilitation medicine.

Research topics ranged from design considerations for a prosthetic foot emulator, to a modified walking cane for teaching Veterans and others with arthritic knees to use a cane better, to differences in bone mineral density in feet



Student Presenters at the Symposium

Back row (l. to r.): Eric Thorhauer, Anthony Anderson, Alex Berardo-Cates, and Lalit Palve

Front row (l. to r.): Kalle Chastain, Jacob Hornbuckle, Evan Schuster, Beth Halsne, and Gaurav Mukherjee

between adults with and without diabetes mellitus. Other research projects focused on improvements to research methods and devices.

Rocker Bottom Shoes and Ankle-Foot Orthoses to Be Evaluated by Drs. Aubin and Sangeorzan Under New Grant



Patrick Aubin, PhD

Although rocker bottom shoes and ankle-foot orthoses (ankle braces) are commonly prescribed for ankle osteoarthritis, surprisingly little clinical evidence supports their use.

Patrick Aubin, PhD, and CLiMB Director Bruce Sangeorzan, MD, received a 3-year merit grant of \$825,000 from the VA Rehabilitation Research and Development (RR&D) Service to learn more about whether these measures really work. The study will run from November 2017 to October 2020.

Study participants will wear rocker bottom shoes, ankle-foot orthoses, and control shoes for 3-week periods, then their levels of ankle pain, activity and joint range of motion will be compared among the shoe/insert types.



Bruce Sangeorzan, MD

Dr. Morgenroth Receives \$2.5 Million Department of Defense Grant to Study Test-Drive Strategy for Prosthetic Foot Prescription



David Morgenroth, MD

One barrier an amputee may encounter in finding a comfortable prosthetic foot that works well is the cost and time required to try several different options. Currently clinicians tend to prescribe whichever device they are most familiar with. However, what works well for one Veteran may not work well for another.

To address this issue, David Morgenroth, MD, applied for and received a \$2.5 million Prosthetics Outcomes Research Award from the Department of Defense. The grant began in September 2016 and will run to August 2019.

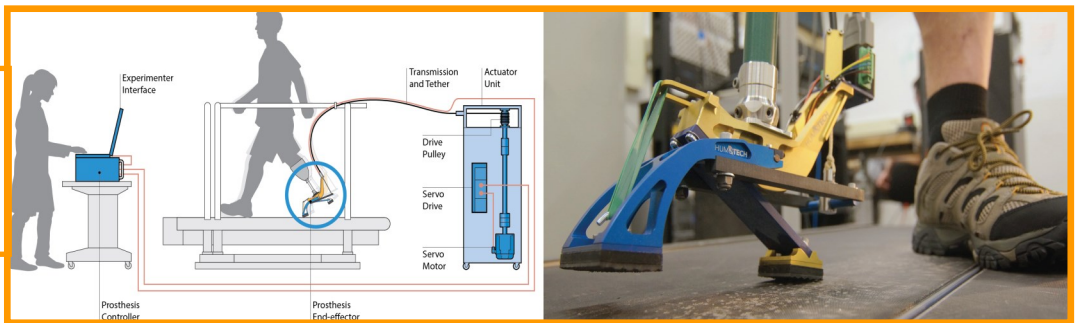
Dr. Morgenroth will investigate whether a prosthetic foot emulator or a brief trial of

specific commercial feet is better for predicting foot preference, satisfaction, and mobility outcomes. The 'prosthetic foot emulator' is a robotic prosthetic foot that mimics the mechanical properties of commercial prosthetic feet without the amputee needing to physically change feet. The emulator can be attached to the prescribed prosthetic socket and worn like a regular prosthetic foot, providing amputees the opportunity to quickly 'test-drive' many prosthetic foot designs in the lab or clinic.

The final stage of the project will include trials of test-drive strategies for prosthetic foot prescription in the clinical setting.

Prosthetic Foot Emulator

Near right: Schematic of prosthetic foot emulator
Far right: Emulator foot



New Pivot-Flex Prosthetic Foot to Be Investigated by Dr. Klute



Glenn Klute, PhD

Prosthetic feet have yet to be designed that can mimic the full 3-D rotational range of the human ankle, particularly the coupled motions of pivoting and flexing the foot. The absence of this natural coupling may be related to the high incidence of soft tissue injuries, compensatory gait, and overall dissatisfaction with their prostheses reported by lower-limb amputees.

Principal investigator Glenn Klute, PhD, has received a grant for \$820,000 from the VA RR&D Service to see whether the Pivot-Flex Foot, a new prosthetic foot that mimics the coupled motion, will help reduce soft-tissue injuries and gait

compensations among Veterans with lower-limb loss when compared to a standard-of-care prosthesis. The grant is a 3-year award that runs from October 2017 to September 2020.

According to Dr. Klute, if the Pivot-Flex Foot is more successful than the standard-of-care prosthesis (Össur Vari-Flex XC Rotate), the new prosthetic foot will have strong commercial potential, because "it can be manufactured in a similar cost range as existing commercial feet and already fits within the existing reimbursement classification code structure, so the barriers to commercialization are low."

Researchers Iaquinto and Aubin Win VA Career Development Awards

Researchers Joseph Iaquinto, PhD, and Patrick Aubin, PhD, won VA Career Development Awards in 2016. Winners were selected by the VA RR&D Service following a competitive review process. Each of them received a 5-year award of approximately \$1 million to support future research efforts. In addition, both will receive mentoring from senior scientists.

Dr. Iaquinto joined CLIMB in 2011 after receiving his doctorate in Biomedical Engineering from Virginia Commonwealth University. He was “quite ecstatic” to learn of his award last fall. He will use his funding “to improve diagnostic imaging in patients with ankle arthritis, with the hope of identifying markers associated with certain types of future arthritic development. The early detection of arthritic risk factors may ultimately lead to strategies that delay or prevent ankle arthritis.”

His broader research interests include “disease, injury and treatment-related changes in orthopaedic biomechanics,

particularly of the foot and ankle.”

Dr. Aubin first worked for CLIMB as a research assistant from 2004 to 2010 while completing his Master’s and PhD in Electrical Engineering at the University of Washington. He then spent two years as a Fulbright and Whitaker Scholar in Lithuania and a year as a Postdoctoral Fellow at Harvard University before returning to CLIMB as a research scientist in 2013.

He was “eager to get started and make an impact” after learning of his award. He plans to design a new biarticular prosthetic leg that mimics the function of the biarticular (“crossing two joints”) gastrocnemius muscle, which runs from above the knee to below the ankle. His team hopes the biarticular prosthesis will improve the mobility of Veterans with lower limb loss.

Dr. Aubin’s broader research interest is in “how human mobility can be augmented by robotic and artificial intelligence aids—basically anywhere there is a machine and a human user working together.”



Patrick Aubin, PhD



Joseph Iaquinto, PhD



Alyssa Ricketts



Eric Thorhauer

Two Students Receive Awards for Best Research Talks at Northwest Biomechanics Symposium

Two student researchers in Dr. Bil Ledoux’s research group won awards at the 13th Annual Northwest Biomechanics Symposium (NWBS) held on May 19 and 20 in Eugene, OR.

Eric Thorhauer, a PhD student in the University of Washington Department of Mechanical Engineering, won the prestigious Best Master’s Presentation for his work entitled “In Vivo Ankle Ligament Elongation Patterns During Gait.” Eric’s research used a special imaging system (the biplane fluoroscopy system) to track ankle and foot ligament lengths during functional tasks such as walking.

Alyssa Ricketts, an undergraduate researcher in Dr. Ledoux’s group and a senior in the Department of

Bioengineering at the University of Washington, was one of 4 awardees of the Best Undergraduate Presentation. Her abstract was titled, “Ankle Arthroplasty Increases Joint Range of Motion in End-Stage Arthritic Patients.” She discussed preliminary results from a 2-year study that used a multisegment foot model to quantify foot motion.

The NWBS is a yearly regional biomechanics conference that offers undergraduate, graduate, and medical students the opportunity to present their research in a relatively low-key environment. It has been held every year since 2005 and rotates throughout the Pacific Northwest.

CENTER FOR LIMB LOSS AND MOBILITY

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We're on the Web! Watch for our major website update, coming later this fall!
www.amputation.research.va.gov/

What's In a Name?

The **Center for Limb Loss and MoBility (CLiMB)** is the new, more user-friendly name of the Center of Excellence for Limb Loss Prevention and Prosthetic Engineering.

The **primary mission** of CLiMB is to conduct research aimed at improving the quality of life and functional status of Veterans and Servicemembers who have had a lower-limb amputation for any reason, as well as those who are at risk for such an amputation due to certain medical conditions. The mission supports several priority rehabilitation areas within the VA: lower-extremity impairment, dysvascular amputation and combat-related amputation.

The CLiMB research team is multidisciplinary and includes orthopedic surgeons, physiatrists, engineers, psychologists, human motion and foot-ankle biomechanists, epidemiologists and prosthetists. The Center's total staff now includes close to 40 people, including investigators, research and administrative staff, and students.

The **secondary mission** of CLiMB is to train the next generation of investigators, which will enable the VA to continue enhancing the care it provides to Veterans and Servicemembers for decades to come. The Center recruits trainees to participate in its research program from several academic fields including engineering, prosthetics, orthopedics and rehabilitation medicine.

Staff Transitions

Arrivals

Leila Kirkpatrick, MPH, joined CLiMB as the new Administrative Officer in August 2016 following Wesley Edmundson's retirement. Leila manages many critical operations, including staff hiring and management, grant proposal submissions and major equipment purchases to prepare for the Center's move to a new building next year.

Our new research coordinator, **Jenn Hicks, BS**, handles participant recruitment, eligibility screening and enrollment. She also handles other administrative and Institutional Review Board (IRB)-related tasks.

Science writer **Kerrie Schurr, MSCE**, is our newsletter writer and editor. She is also spearheading our website update project and preparing yearly IRB review submissions for the Center's clinical studies.

David Boe, MS, recently joined the lab of Dr. Eric Rombokas as a

researcher and project manager. David will administer the daily functions of the lab and use his background in prosthetics and neuroscience on a variety of projects.

Departures

CLiMB bids farewell to study recruiter **Kathy Shaffer, BS**, and Gait Lab manager **Ava Segal, MS**. Both will be greatly missed.

Kathy is now a Principal Research Associate for Omeros Corporation in Seattle, where she's developing novel monoclonal antibodies for therapeutic, research and diagnostic applications.

Ava began her 15-year tenure at CLiMB in 2002 as a research technician. She completed a Master's in Mechanical Engineering at the University of Washington, then rejoined the staff as a research scientist and Gait Lab Manager. She is moving to Colorado to pursue her PhD.



Staff Sgt. Brandon Dotson completes the 40th Marine Corps Marathon Oct. 25, 2015, in Arlington, VA, after 12 years of active duty service in the Marine Corps. He went on to complete two more marathons in 15 days.
Photo credit: Sgt. Ida Irby